



Prepared for Ecology on behalf of the Stormwater Workgroup by Washington Department of Fish & Wildlife

## Goal & Background

The Stormwater Action Monitoring (SAM) Status and Trends in Receiving Waters program conducts monitoring in Puget Sound nearshore marine waters to provide a regional assessment of whether collective stormwater management actions are leading to improved receiving water conditions. The SAM Puget Sound Nearshore Mussel Monitoring study focuses on the bioaccumulation of pollutants in caged native bay mussels (*Mytilus trossulus*) to evaluate the current status and trends of nearshore conditions (Figure 1). The 2021/2022 survey was the first conducted under the [new SAM study design](#), whereby the sampling area expanded to the entire nearshore of the Puget Lowland ecoregion and the study sites were stratified into four categories by estimates of average percentage of total impervious area of the contributing upland watersheds.

The primary goal for the survey was to determine the *status* of contamination in the marine nearshore during Winter 2021/2022. The status was mainly described by determining the detection frequency and distribution of contaminant concentration data, and the spatial extent of contamination in the Puget Sound Lowland ecoregion. Determining how contaminant concentration results from the survey compare against project-specific thresholds and how key findings in this survey are either in line with or contrast with previous surveys (conducted only within urban growth areas) were also objectives.



Figure 1. Bagged bay mussels (*Mytilus trossulus*) in a predator exclusion cage at the Chimacum Creek Delta monitoring site.

## Survey Findings

Like prior survey years, the most abundant organic contaminants detected in mussels of the Puget Sound nearshore are:

- polycyclic aromatic hydrocarbons (as  $\Sigma 16\text{PAH}$ )
- polychlorinated biphenyls (as total PCBs)
- polybrominated diphenyl ethers (as  $\Sigma 11\text{PBDEs}$ )
- dichlorodiphenyltrichloroethane and its metabolites (as  $\Sigma 6\text{DDTs}$ ).

Though, the detection frequency for PBDEs noticeably reduced in this survey. At previous survey sites located within the urban growth areas, PBDEs were detected at a frequency greater than 80%, while detections at current sites across the entire Puget Sound are below 50%. All metals tested (arsenic, cadmium, copper, lead, mercury, zinc) continue to be frequently detected in mussels. The central tendency concentrations of most of the measured organic and metal contaminants in mussels at survey sites across the Puget Sound shoreline were similar or lower when compared to concentrations from prior surveys with sites within the urban growth areas only. Estimates of the spatial extent of mussel tissue contamination in the Puget Lowland ecoregion indicate that most of the Puget Sound nearshore length (approximately 50-90%) had low concentrations of  $\Sigma 16\text{PAHs}$ , TPCBs,  $\Sigma 11\text{PBDEs}$ , and  $\Sigma 6\text{DDTs}$  based on project-specific thresholds, and less than approximately 5% of the nearshore length had high concentrations (Figure 2).

## Collectively improving stormwater management

**Stormwater Action Monitoring (SAM)** is a collaborative, regional stormwater monitoring program that is funded by more than 90 Western Washington cities and counties, the ports of Seattle and Tacoma, and the Washington State Department of Transportation. SAM's goal is to improve stormwater management to reduce pollution, improve water quality, and reduce flooding. We do this by measuring stormwater impacts on the environment and evaluating the effectiveness of stormwater management actions.

Similarly, for most of the metals (cadmium, copper, lead, mercury, zinc), a small proportion (approximately 0-10%) of the nearshore length had values exceeding the high concentration threshold. With the sampling area expanded to the entire Puget Lowland ecoregion in this survey, most of the organic and metal contaminant distribution patterns shifted toward lower concentrations across the nearshore. A higher proportion of the nearshore length had values below the low concentration threshold, and a lower proportion of the nearshore length had values above the high concentration threshold.

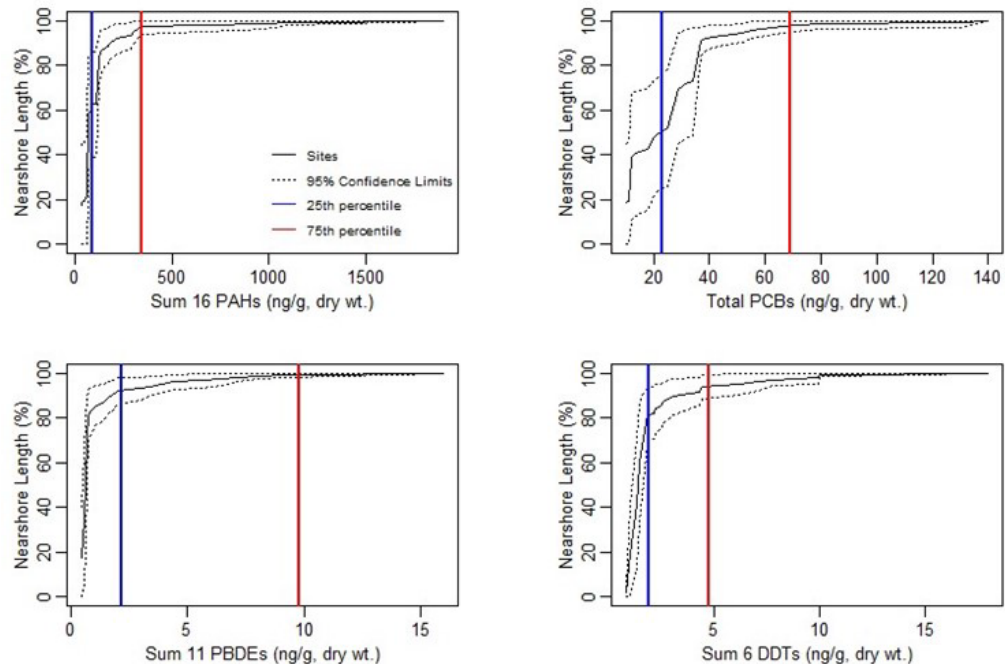


Figure 2. Cumulative distribution function (CDF) plot of  $\Sigma 16$ PAHs, TPCBs,  $\Sigma 11$ PBDEs, and  $\Sigma 6$ DDTs concentrations in mussels from the 2021/2022 SAM study sites. Values to the left of the blue line represent low concentrations, and values to the right of red line represent high concentrations based on project-specific threshold values determined using percentiles (25th and 75th).

## Why does this study matter?

This long-term status and trends monitoring of the marine nearshore will evaluate whether and how stormwater discharge and the stormwater management actions implemented in the region are affecting nearshore biota contaminant levels.

## What should stormwater managers do with this information?

Stormwater managers know that effective and lasting improvements to infrastructure, best management practices, and changing behaviors of Puget Sound residents takes time. Monitoring long term in several key environments such as the marine nearshore will help us determine if conditions are getting better despite population growth as building codes and stormwater management improves in the areas adjacent to the nearshore.

## What will Ecology do with this information?

Ecology will use this objective regional information to evaluate the efficacy of the municipal stormwater permitting program over time in slowing or reversing the decline in the marine nearshore. While there are many other potential dischargers beyond municipal stormwater impacting Puget Sound's water quality, the nearshore is the most likely environment for stormwater impacts to be measured and tracked, especially as the region expands existing and new development. Ecology supports SAM's receiving water studies under the municipal stormwater permits and will continue to coordinate findings with SAM's urban stream monitoring program in Puget Sound.

For more information, including the full final report, visit the [SAM status & trends webpage](#).

Data are available on [EIM database](#) with Study ID SAM\_MNM.

To request an ADA accommodation, contact Ecology by phone at 360-407-6600 or email at [chelsea.morris@ecy.wa.gov](mailto:chelsea.morris@ecy.wa.gov), or visit <https://ecology.wa.gov/accessibility>. For Relay Service or TTY call 711 or 877-833-6341.